

## Patent claims

1. A device for the treatment of femoral fractures with

- 5       A) an intramedullary pin (1) with a central axis (2), a front portion (3) that can be introduced into the medullary canal of the femur, a rear portion (4), a passage (5) with a non-circular cross-section (6) that passes through the rear portion (4) obliquely to the longitudinal axis (2),
- 10       B) a sliding sleeve (10), that can pass through the non-circular passage (5), with a front end (11), a rear end (12), a central longitudinal bore (13), an external jacket surface (14), an internal jacket surface (15) and a longitudinal axis (16),
- 15       C) a longitudinal bone fixing element (20) with a longitudinal axis (21), a head portion (22) with fixing means (23) that can engage the femoral head during use, as well as a shaft (24) that can be coaxially introduced into the sliding sleeve (10), wherein
- D) the external jacket surface (14) of the sliding sleeve (10) has at least in parts a non-circular cross-section (17), characterised in that
- 20       E) the internal jacket surface (15) of the sliding sleeve (10) has a round cross-section (38), and
- F) locking means (30) are provided to optionally block the rotation of the longitudinal bone fixing element (20) in the sliding sleeve (10).

25       2. A device according to claim 1, characterised in that at the free end (27) of the shaft (24) a bore (25) is provided coaxially with the longitudinal axis (21), that preferably has an inside thread (26).

30       3. A device according to claim 1 or 2, characterised in that the locking means (30) is a fixing screw with a screw head (31) having a diameter of  $D$  and a screw shank (33) with a diameter of  $d$  having an outside thread (32), while  $D > d$ .

4. A device according to claim 3, characterised in that the outside thread (32) of the screw shank (33) corresponds to the inside thread (26) of the bore (25) of the shaft (24) of the longitudinal bone fixing element (20) and can be screwed into the bore (25) until the screw head (31) abuts against the rear end (12) of the sliding sleeve (10) and a further tightening of the fixing screw, acting as locking means (30), will result in a force-locked connection between the longitudinal bone fixing element (20) and the sliding sleeve (10).
5. A device according to any one of claims 1 to 4, characterised in that the shaft (24) of the longitudinal bone fixing element (20) is so mounted in the sliding sleeve (10) that it can rotate but is axially fixed.
6. A device according to claim 5, characterised in that the shaft (24) of the longitudinal bone fixing element (20) has a first annular groove (28) and the internal jacket surface (15) of the sliding sleeve (10) a second annular groove (19) and that an element (40), blocking the axial displacement of the shaft (24) in the sliding sleeve (10), is provided preferably in the form of a ring, engaging the two annular grooves (28, 19).
7. A device according to claim 6, characterised in that the rear end (12) of the sliding sleeve (10) protrudes past the free end (27) of the shaft (24) of the longitudinal bone fixing element (20) by a specific amount  $x$ , preferably by at least 0.01 mm.
8. A device according to claim 1, characterised in that on the free end (27) of the shaft (24) an outside thread (29) is provided.
9. A device according to claim 8, characterised in that the blocking means (30) is a nut with an inside thread (34) that corresponds to the outside thread (29) of the shaft (24).
10. A device according to any one of claims 1 to 9, characterised in that the non-circular cross-section (6) of the passage (5) has peripheral part-sections in the form of partial circular arcs.

11. A device according to any one of claims 1 to 10, characterised in that the fixing means (23) of the longitudinal bone fixing element (20) is a helical blade, preferably a double helical blade.
- 5 12. A device according to any of claims 1 to 11, characterised in that the fixing means (23) is a screw thread, a chisel, a pin, a T-section or a double T-section.
- 10 13. A device according to any one of claims 1 to 12, characterised in that the head portion (22) of the longitudinal bone fixing element (20) is constructed as a multi-start thread, preferably as a four-start thread.
- 15 14. A device according to any one of claims 1 to 13, characterised in that the thread of the head portion (22) has a pitch of at least 50 mm, preferably at least 80 mm.
- 20 15. A device according to any one of claims 1 to 14, characterised in that the locking means (30), that are preferably realised in the form of a fixing screw or a nut, are so dimensioned that they act as an axial stop relative to the passage (5).
- 25 16. A device according to any one of claims 1 to 15, characterised in that the longitudinal bone fixing element (20) is a hip screw.
- 30 17. A device according to any of claims 1 to 15, characterised in that the longitudinal bone fixing element (20) is a helical screw.
18. An intramedullary pin (1) to be used in a device according to any one of claims 1 to 17, characterised in that it has a central longitudinal axis (2), a front portion (3) that can be introduced into the medullary canal of the femur, a rear portion (4) and a passage (5) with a non-circular cross-section (6) that passes through the rear portion (4) obliquely to the longitudinal axis (2), characterised in that the non-circular cross-section (6) of the passage (5) has peripheral part-sections in the form of partial circular arcs.